

Summary

Staff Draft Definition of Appropriate Agricultural Water Use Measurement

BACKGROUND

Introduction:

Measurement of water usage in the agricultural landscape is as varied as the crops themselves. Some regions or districts rely on precise and frequent measurement to track how water moves through and within their systems. Others depend more heavily on estimates. The approach to measurement grows out of unique, place-specific histories, economics and needs.

Locals rely on the information generated for a variety of purposes. Measurement data can help local water districts distribute water to users, make operational decisions and improvements, and charge for water according to the amount used.

More recently, as California's water resources have become increasingly scarce, diverse stakeholder groups also have recognized the importance of measurement to state and federal agencies trying to manage a much-in-demand resource. Measurement can, among other things, provide better information on statewide and regional water use to support planning and water rights objectives, allow water users to undertake and demonstrate the effects of efficiency measures, and facilitate valid water transfers.

CALFED Interest and Involvement in Agricultural Water Use Measurement:

Recognizing the importance of and intense stakeholder interest in measurement, the CALFED Bay-Delta Program's August 2000 Record of Decision (ROD) called on CALFED's Water Use Efficiency (WUE) Program to take a closer look at measurement and determine what is needed and, as appropriate, put forward legislative or other strategies to bolster the current approach.

“CALFED Agencies will work with the California State Legislature to develop legislation ...requiring the appropriate measurement of all water uses in the State of California.”

CALFED Agencies have taken the charge seriously. With the ongoing guidance of a panel of experts¹ and the continued input of diverse and informed stakeholders and

¹ The Panel represents a cross-disciplinary mix of six nationally recognized experts who collectively provide understanding in the areas of measurement technology/hardware; resource economics;

state and federal agency representatives, the California Bay-Delta Authority has undertaken an extensive, rigorous and region-specific analysis intended to define “appropriate measurement” as it relates to agricultural water use and begin to identify strategies for moving forward. (A separate process is being used to address urban water use measurement.)

The analysis, now in draft form for the Panel’s review and consideration, is summarized below and presented in greater detail in the various attachments. The analysis was prepared by a Technical Team ² consisting of CALFED staff and consultants.

This analysis is intended to define, in a credible and technically sound and unbiased manner, the types of agricultural water use measurement that are now or soon likely to be considered appropriate and necessary in California. The intent of the attached analysis is neither to chart nor preclude any particular implementation path. That task is to be handled in subsequent stakeholder discussions and will, like other facets of CALFED’s Water Use Efficiency Program, be underpinned by the Program’s commitment to regionally sensitive, incentive-driven and cost-effective approaches.

The accompanying materials and draft conclusions are to be discussed by the Panel during its final set of deliberations, scheduled for early June 2003. Following the Panel’s deliberations, a summary report will be drafted and disseminated to and discussed with CALFED decision-making bodies, stakeholders and the public. Following these discussions, the CALFED Bay-Delta Authority intends to convene a diverse stakeholder group to help the WUE Program consider the Panel’s definition of appropriate measurement and develop an implementation strategy capable of being broadly supported by the many affected stakeholder communities. Finally, the Authority staff will work with the Administration and Legislature to develop the necessary package of legislative, regulatory and/or budgetary actions.

Overarching Principles:

In moving forward with this task, the analysis has been guided and shaped by a set of overarching principles and considerations. Some of the drivers are fundamental to the CALFED Program. Others have been articulated by the Panel. The key considerations are outlined below:

groundwater hydrology; technical water policy; and, water district operations; and, irrigation engineering. A listing of panelists is included in Section 8 of the accompanying materials.

² The Technical Team consists of CALFED staff and consultants with expertise in hydrology, irrigation technologies and practices, resource economics, water law and stakeholder involvement/facilitation. At times, panelists Jack Keller and Steve Hatchett also have participated in a liaison role to ensure the Technical Team’s work is consistent with previous Panel guidance.

- **Open process with stakeholder involvement.** CALFED's Record of Decision acknowledges the value of and calls for stakeholder involvement. To facilitate this involvement, the Panel's deliberations are structured to allow for and encourage the participation of stakeholder-nominated technical advisors. As well, the Panel's deliberations are conducted in public. Finally, CALFED-convened, stakeholder groups representing diverse agricultural, environmental and agency interests serve as a sounding board regarding Panel design, panelists selection and outcomes.
- **Clear problem definition.** Early on in its deliberations, the Panel called for the articulation of a clear and comprehensive problem definition. Panelists emphasized that any final analysis must be grounded in a solid understanding of the state's current legislative and regulatory approach to measurement, as well as on-the-ground practices. Moreover, it must clearly articulate the concrete limitations to the current approach. Specifically, the Panelists directed the Technical Team to develop a region-by-region picture of the current approaches to measurement, as well as look at and derive lessons from the practices in other states.
- **Objective-driven analysis.** A critical underpinning of the WUE Program is to link water management practices to objectives. This same approach is being applied to discussions regarding appropriate measurement. The Panel called for the analysis to be structured to first explore the objectives of measurement (both surface and groundwater) and then develop a definition that is consistent with the identified objectives. Panelists strongly recommended that the analysis focus primarily on state and federal objectives. At the same time, they recommended that the analysis at least identify important local objectives, as well.
- **Comprehensive definition of measurement.** For the purpose of this analysis, water use measurement is defined as the generation, collection and management of data that provides information about where, how much, and when water is used. Data is generated by a measurement method such as remote sensing for ET determination or a device such as a weir. Collected data is then managed using analysis, quality control and assurance, archiving and reporting. Put simply: For water use measurement to be useful, the collected information must be made available to people who need that information.
- **Flexible framework.** Panelists confirmed the Authority's expectation that the eventual definition of appropriate measurement will need to provide a flexible framework – not a one-size-fits-all prescription. Such flexibility will be important, panelists said, to account for differences among water suppliers' and users' characteristics, such as size, location, water costs and water supply. It will also be important since, given changing technologies, costs and attitudes, the definition of appropriate measurement is also subject to shift over time.

It is important to note here that, while the analysis examines costs associated with different measurement techniques, it does not put forward recommendations related to who pays. CALFED expects that such discussions will be the focus of the subsequent stakeholder deliberations noted above. Moreover, though details are to be worked out, any cost-sharing approach will be consistent with CALFED's principle of beneficiary pays. In other words: If and when a new approach to measurement is put in place, locals would be expected to pay only for those actions that are found to be locally cost-effective. Conversely, if an action is not locally cost-effective but provides statewide benefits, public dollars should be used to make the project cost-effective.

PRELIMINARY ANALYSIS

Current Measurement in California:

The draft analysis summarized below seeks to answer the question: What is the definition of appropriate measurement? To do that, the analysis must be based on a clear picture of the following:

- What are the purposes of agricultural water use measurement?
- What are the current baseline conditions, including an overview of measurement locations and intensities and regional snapshots?
- What are the benefits and limitations of the current approach?

To develop comprehensive answers to these questions, the Technical Team surveyed water suppliers and water users throughout the state, catalogued measurement practices and costs, talked with state and federal water managers and interviewed environmental stakeholders. Team members reviewed the state's regulatory and statutory framework, as well as talked with water managers in six other states to better understand their experiences. Additionally, the Technical Team met with local experts throughout the state to gather relevant data, present the results of its analysis and solicit feedback.

The results of these analyses are summarized briefly below and provided in greater detail in the accompanying materials. Key findings are:

- Current measurement practices are largely driven by local needs, conditions and regulatory requirements. Though there are a variety of state and federal laws and regulations regarding measurement, regional practices are still shaped primarily by district- and on-farm economics, water availability, cropping patterns and local hydrology. Thus, local practices are a direct result of the state's legal and water development history.

- There is a growing sense among many stakeholders that, as the state's water supplies get stretched thinner and thinner, improved measurement of agricultural water use is necessary to support state water planners' and policymakers' efforts to ensure there are sufficient and reliable water supplies today and into the future.
- To help state and federal water planners navigate increasingly contentious and pivotal decisions related to planning, water availability determination, transfers and water use efficiency, improved agricultural water use data is most critical at seven key locations: surface water diversions, groundwater use, crop consumption, return flow, water quality, stream gauging, and farm-gate deliveries. Accuracy needs vary dependent on the measurement location and the use of the information.
- Measurement practices and needs related to tracking surface water diversions, crop consumption, and farm-gate deliveries do not vary significantly from region-to-region. Groundwater use measurement tends to be estimated, using various methods across regions, except in adjudicated basins, where more accurate data is collected. Conversely, measurement and accuracy needs associated with return flow, water quality and stream-gauging are extremely region-specific and tend to defy a single statewide approach.
- For surface water diversions and farm-gate deliveries, most water suppliers and users currently have the capacity to estimate or directly measure water use with an accuracy considered appropriate to support statewide objectives. (Despite this capacity, there are significant gaps – outlined below – in how this data is being collected and managed.)
- The analysis suggests, however, that current practices – including how data is collected, verified, managed and used – has several, significant limitations
 - In several cases, the types of measurement used are not sufficient to provide accurate enough information for the stated objectives. In particular due to the current methods used, the accuracy of crop water consumption and net groundwater are not well known. In addition the information is not collected using the same methods in all regions of the state. Thus, it is not possible to aggregate information across regions to generate reliable estimates of water use and budgets.
 - While in some cases the hardware needed to generate data is sufficient, in many cases information is not being collected and managed in a manner that supports statewide objectives. For example, with farm-gate deliveries, information is available to allow districts to bill customers for the amount of water used. (Billing may be done using volumetric methods or based on crop type being grown.) However, some districts do not routinely store this

information for analytic purposes. As with crop consumption and net groundwater use, it is necessary to structure the data management effort such that information can be aggregated to generate reliable estimates of farm-gate deliveries. This data is necessary if the state is to make objective decisions regarding public funding of district or on-farm improvements. Moreover, better data management can assist local objectives, such as helping the district, among other things: (1) improve delivery service or alter billing structures; or, (2) protect water rights.

- Current measurement of key water balance components, such as crop water consumption and net groundwater use, are generally not collected with sufficient accuracy to enable defensible estimates. Crop water consumption is currently thought to account for 65% of all developed water use in the State yet currently no direct measurement of this water use is made. Having a reliable estimate of crop water consumption would dramatically improve water balances and provide information necessary to determine basin-wide water availability and make water management investments most needed to meet the state's current and future water demands.
- The state does not have enough baseline information at this point to determine what measurement intensity or distribution of measurement points are needed to effectively measure return flow, water quality and stream gauging.

Preliminary Staff Draft Conclusions:

Given the range of findings, the Technical Team has developed a number of preliminary conclusions related to the appropriateness of measurement.

As noted earlier, given shifting costs, technologies and attitudes, these assessments are likely to evolve over time and will necessitate ongoing review and revision. For now, though, the Technical Team puts forward the following draft conclusions for the Panel's consideration. (A more detailed summary of preliminary conclusions is included in the accompanying materials.)

Surface Water Diversions

Appropriate

Measurement: State and federal water planners need accurate information to effectively and efficiently plan and direct infrastructure investment. In addition, the State needs accurate diversion information to make water availability determinations and to credibly adjudicate water rights transfers and disputes. This means major surface water

diversions should be measured using flow-totaling devices, data loggers and telemetry. In addition, the collected data should be managed locally and reported to a state repository.

Expected

Impact:

This approach is expected to have a minimal impact, since greater than 80% of all major surface water diversions are already using such devices. For some local agencies and for the State there is an expanded requirement for data management. Where upgrades are needed, costs on an annual basis are expected to range between \$10,000 and \$15,000 per diversion point.

Groundwater Use

Appropriate

Measurement:

State and federal water managers need reasonably accurate information to characterize net groundwater use. This information is required to help identify sustainable yield and support conjunctive use. This requires continuous regional characterization of groundwater volume using two methods: detailed sub-basin hydrologic balance and water table method. In addition, the collected data should be managed locally and reported to a state repository.

Expected

Impact:

Expected impacts to water users are likely to be minimal. Because the state currently relies on self-reporting and a simple water balance approach to estimate net groundwater use, the proposed method of continuous regional characterizations will mean higher state planning costs. The cost to conduct this level of analysis statewide is roughly \$2 million per year, or about \$0.25 per irrigated acre.

Future Conditional

Linkages:

If the state opts to aggressively manage or allocate groundwater resources, more accurate groundwater information is needed. This level of involvement would require totalizing flow meters or pump testing coupled with time of use to determine gross water pumped. Because the State does not currently allocate groundwater, there is no expected impact at this time. If the state were to implement such an approach, a shift to totalizing flow meters or pump testing would be significant, since less than one-third of ground-water use is currently measured this way and annual costs would likely range

from \$500 to \$1,000 per wellhead or \$20 million to \$25 million statewide.

Crop Consumption

Appropriate
Measurement:

State and federal water managers need a direct and more accurate measurement of crop consumption, which represents 65% of all consumptive water use in California. This improved measurement is needed to calculate water balances that can more accurately inform supply and demand projections and state and federal resource allocations. This means using satellite-generated remote-sensing, with a monthly time-step, during the growing season. In addition, the collected data should be housed in a state repository, similar in nature to the CIMIS data network.

Expected
Impact:

This approach is expected to have no direct impact on water users. It does, however, represent a major change in how crop consumption is measured in California, since most is currently estimated using rolling (five-year) inventory of crop acreage, average ET data and existing crop coefficients. Annual cost of measurement would be roughly \$0.5 million and would likely be borne by the state and federal water agencies seeking improved estimate of crop water consumption data.

Return Flow, Water Quality and Stream Gauging

Appropriate
Measurement:

Not yet defined.

Future Conditional
Linkages

Measurement information for these locations is needed for two purposes: to accurately characterize the state's water system; and, where necessary, to address location-specific objectives such as water quality, water availability or water transfers. Current measurement requirements for these locations are driven by place- or constituent-specific needs. There is not currently enough information, agency and stakeholder representatives agree, to articulate credible statewide measurement requirements. The recommendation for this level is that the state undertake a comprehensive review to better determine its needs for baseline information. There is no expected direct impact to water users at

this time, as the state would be responsible for undertaking the comprehensive review outlined above.

Farm-Gate Deliveries

Appropriate

Measurement: All existing farm-gate measurement hardware³ is sufficient to meet statewide objectives. However, state and federal water managers need aggregate estimates of farm-gate deliveries to assist statewide planning and improve water balance estimates. This means requiring that information on farm-gate deliveries, whether currently estimated or directly measured, be collected, managed locally and reported to a statewide repository.

Expected

Impact: Requiring farm-gate delivery data does not represent an upgrade of farm-gate hardware, but it would imply an increase in data collection and reporting activities for some water suppliers. Water suppliers not currently collecting this information may need to add a half- to full-time staff position for data management.

Future Conditional

Linkages: If the state were to mandate volumetric water pricing, then all farm-gate deliveries would have to be measured at the higher levels (measuring flow rates, on average, three times per structure use or at least three times per day during continuous use or using flow-totaling devices, data loggers and telemetry). For all users, the collected data should be managed locally and reported to a state repository. Because the State does not currently mandate volumetric water pricing, there is no expected impact at this time. However, if the state were to pursue such a policy, the impact would be significant to convert those turnouts currently using the most infrequent measurements. The estimated annual costs for shifting those turnouts to much more frequent measurements of flow rates using rated structures are expected to range from \$20 million to \$30 million or \$25 to \$35 per affected acre.

³ Those already tracking farm-gate deliveries at the higher accuracy levels - measuring flow rates, on average, three times per structure use or at least three times per day during continuous use or using flow-totaling devices, data loggers and telemetry – are at the appropriate level. For the small percentage of water suppliers estimating deliveries, the analysis suggests it is neither cost-effective nor essential that they shift to a more aggressive measurement strategy.

Beyond the measurement location-specific assessments, the analysis suggests an additional set of recommendations related to appropriate measurement. Any new approach to measurement must be adaptive and structured in a manner that enables an evolving definition of “appropriateness.” This adaptive structure would, over time, account for changes in pertinent factors such as technology and economics. Accordingly, any legislative or regulatory implementation strategy must be carefully crafted to account, for among other things:

- The impact of evolving technologies, shifting attitudes, and changing costs and benefits on the appropriateness of different measurement strategies;
- The need, in some instances, to undertake more project-specific cost and benefit analyses, particularly in those cases where implementation costs are high and there are locally unique costs and benefits; and,
- The involvement of affected stakeholders in designing implementation approaches that account for local sensitivities and differences.

Finally, the Technical Team’s look at other states suggests three additional implementation considerations: (1) the need to accompany any measurement requirements with an appropriate set of available exemptions, variances and “second-best” approaches; (2) the importance of focusing on how measurement “data” will be turned into “information” useful to governmental and private actors; and, (3) the necessity to consider and, wherever possible, ameliorate for the labor-intensive nature of certain measurement requirements.

NEXT STEPS

As noted earlier, CALFED is committed to working through a two-step process to ensure it puts forward an approach to measurement that is both technically sound and capable of being broadly supported.

The first step – the Panel’s determination of a definition of appropriate measurement – is nearing completion. Following the public workshops, CALFED will move forward with the following next steps:

- ***Final Panel Deliberations.*** The Panel is slated to meet in early June to review and revise the draft analysis. A summary of public workshop comments will be presented to the Panel to inform its deliberations and final recommendations.
- ***Final Panel Report.*** Following the Panel’s deliberations, a summary report will be drafted for review and final revision by the Panel and subsequent distribution to and discussion with CALFED advisory- and decision-making bodies and the public.

Following these discussions, the CALFED Bay-Delta Authority intends to move forward with the second step: developing an implementation strategy capable of being broadly supported by the many affected stakeholder communities. This phase, expected to take no more than six months, will have several steps:

- ***Program Manager Work Group.*** The WUE Program will convene a diverse stakeholder group to serve as a sounding board as it develops a proposed implementation approach. As discussed earlier, the Program's proposed approach will draw on the Panel's report and inevitably shaped by the Program's commitment to regionally sensitive, incentive-driven and cost-effective approaches.
- ***CALFED and Public Reviews.*** Once drafted, the WUE Program proposed approach will be drafted for review and final revision by the Panel and subsequent distribution to and discussion with CALFED advisory- and decision-making bodies and the public.
- ***Legislative/Agency Discussions.*** Finally, the WUE Program will work with the administration and legislature, as necessary, to put forward an implementation approach. It's uncertain at this point whether a final recommended implementation package will necessitate legislative change, administrative changes or both.

The Technical Team looks forward to reviewing and discussing this analysis with interested members of the public.